

**CLAIMS:**

1. A method comprising:  
storing a virtual storage map (VSM) to allocate a primary virtual storage and a secondary virtual storage; and  
updating the VSM to reallocate the primary virtual storage to include data written to the secondary virtual storage.
2. The method of claim 1, wherein the VSM allocates a set of storage units for each virtual storage, and further wherein updating the VSM comprises updating the VSM to reallocate at least one storage unit from the secondary virtual storage to the primary storage device.
3. The method of claim 1, further comprising:  
receiving a save command; and  
updating the VSM in response to the save command.
4. The method of claim 3, wherein receiving a save command comprises receiving a signal in response to an actuated hardware switch.
5. The method of claim 3, wherein receiving a save command comprises receiving the save command from software executing on a host computer.
6. The method of claim 3, wherein receiving a save command comprises receiving a signal from a handheld device.
7. The method of claim 6, wherein receiving the signal from the handheld device comprises receiving a wireless communication from the handheld device.
8. The method of claim 1, further comprising:

storing data received from a host computer prior to a time  $T_0$  on the primary virtual storage; and

storing data received from the host computer after time  $T_0$  on the secondary virtual storage.

9. The method of claim 8, further comprising storing a record of locations within secondary virtual storage to which the data written has been written.

10. The method of claim 9, further comprising selectively reading data from the primary virtual storage and the secondary virtual storage based on the record.

11. The method of claim 9, wherein the VSM allocates a set of storage units for each virtual storage, and wherein storing a record comprises storing a delta data map (DDM) to indicate those storage units of the secondary virtual storage to which the data has been written.

12. The method of claim 11, wherein the DDM and the VSM comprises bitmaps having a set of binary values, wherein each binary value corresponds to a respective storage unit, and further wherein updating the VSM includes changing a state of at least one of the binary values.

13. The method of claim 1, wherein the VSM defines a set of storage units within one or more logical storage volumes, and further wherein the logical storage volumes comprise one or more physical storage mediums.

14. The method of claim 1, wherein storing the VSM comprises storing the VSM in a computer-readable medium coupled to a host computer.

15. The method of claim 1, wherein storing the VSM comprises storing the VSM in an embedded memory of a controller coupled to a host computer via an input/output (I/O) bus.

16. The method of claim 1, where updating the VSM comprises:
  - storing a record of locations of the secondary virtual storage to which the data has been written after a time  $T_0$ ;
  - receiving a save command at a time  $T_s$  where  $T_s > T_0$ ; and
  - in response to the save command, adjusting the VSM to redefine the primary virtual storage to include the data written to the secondary storage device after  $T_0$ .
17. The method of claim 1, further comprising:
  - storing the VSM as a bitmap defining a set of storage units for each virtual storage, wherein each binary value of the bitmap corresponds to a storage unit within each set; and
  - storing a delta data map (DDM) as a bitmap to indicate those storage units of the secondary virtual storage to which data has been written after a time  $T_0$ ;
18. The method of claim 17, wherein updating the VSM comprises:
  - setting each bit of the VSM bitmap based upon an exclusive or operation (XOR) of the binary value of VSM bit and a corresponding bit within the DDM; and
  - clearing the corresponding bit within the DDM.
19. The method of claim 1, further comprising:
  - storing the VSM to define a set of storage units for the primary virtual storage and the secondary virtual storage; and
  - storing status data for each storage unit of secondary virtual storage, wherein the status data indicates whether each storage unit needs to be reallocated.
20. The method of claim 19, wherein updating the VSM comprises:
  - updating the VSM to reallocate the primary virtual storage during free cycles of a bus; and
  - updating the corresponding status data while updating the VSM.
21. The method of claim 1, further comprising:

storing the VSM to define a set of storage units for the primary virtual storage and the secondary virtual storage; and

storing version information for the storage units of secondary virtual storage, wherein the version information indicates a current version for each storage unit of the secondary virtual storage.

22. The method of claim 21, wherein updating the VSM comprises:
- incrementing a system version indicator upon receiving a save command;
  - in response to a write request to a storage unit of the secondary virtual storage, comparing the system version indicator with the save version for the storage unit indicated by the write request;
  - reallocating the primary virtual storage based on the comparison; and
  - updating the version for the storage unit indicated by the write request.
23. An apparatus comprising:
- a computer-readable medium to store a virtual storage map (VSM) allocating a primary virtual storage and a secondary virtual storage within a storage system; and
  - a control unit to update the VSM to reallocate the primary virtual storage to include data written to the secondary virtual storage.
24. The apparatus of claim 23, further comprising:
- a first interface coupled to the control unit to receive storage requests from a processor; and
  - a second interface coupling the control unit to the storage system.
25. The apparatus of claim 23, further comprising an input/output (I/O) interface to receive a save command, wherein the control unit reallocates the primary virtual storage in response to the save command.
26. The apparatus of claim 25, wherein the I/O interface receives a signal from an actuated switch.

27. The apparatus of claim 25, wherein the I/O interface receives a wireless signal.
28. The apparatus of claim 25, wherein the I/O interface receives the save command from software executing on a computing device.
29. The apparatus of claim 23, wherein the VSM represents allocation of a set of storage units for each virtual storage, and further wherein the control unit reallocates at least one storage unit from the secondary virtual storage to the primary storage device.
30. The apparatus of claim 23, wherein the control unit stores data received from a processor prior to a time  $T_0$  on the primary virtual storage, and further wherein the control unit stores data received from the processor after time  $T_0$  on the secondary virtual storage.
31. The apparatus of claim 23, wherein the computer-readable medium further stores a record of locations of the secondary virtual storage to which data has been written.
32. The apparatus of claim 31, wherein the control unit selectively reads data from the primary virtual storage and the secondary virtual storage based on the record.
33. The apparatus of claim 31, wherein the VSM represents allocation of a set of storage units for each virtual storage, and the record comprises a delta data map (DDM) to indicate those storage units of the secondary virtual storage to which the data has been written.
34. The apparatus of claim 33, wherein the DDM and the VSM comprises bitmaps having a set of binary values, wherein each binary value corresponds to a respective storage unit, and further wherein the control unit reallocates the primary virtual storage by changing a state of at least one of the binary values.
35. The apparatus of claim 34, wherein the control unit reallocates the primary virtual storage by setting each bit of the VSM bitmap based upon an exclusive or (XOR) of the

binary value of VSM bit and a corresponding bit within the DDM, and clearing the corresponding bit within the DDM.

36. The apparatus of claim 23, wherein the VSM represents allocation of a set of storage units for each of the virtual storages, and further wherein the computer-readable medium stores status data indicating whether each storage unit of the secondary virtual storage needs to be reallocated.

37. The apparatus of claim 23, wherein the VSM represents allocation of a set of storage units for each of the virtual storages, and further wherein the computer-readable medium stores version data indicating a current version for each storage unit of the secondary virtual storage.

38. A system comprising:  
 a processor;  
 a storage system having one or more physical storage devices; and  
 a controller coupled to the processor and the storage system, wherein the controller maintains a virtual storage map (VSM) allocating a primary virtual storage and a secondary virtual storage within a storage system.

39. The system of claim 38, wherein the controller further comprises a computer-readable medium to store the VSM.

40. The system of claim 38, wherein the controller stores the VSM within the storage system.

41. The system of claim 38, wherein the controller stores data received from a processor prior to a time  $T_0$  on the primary virtual storage, and further wherein the control unit stores data received from the processor after time  $T_0$  on the secondary virtual storage.

42. The system of claim 41, wherein the controller updates the VSM in response to a save command to reallocate the primary virtual storage to include data written to the secondary virtual storage.

43. The system of claim 42, further comprising an input/output (I/O) device to issue a save command to the controller.

44. The system of claim 43, wherein the I/O device provides a signal to the controller upon actuation of a hardware switch.

45. The system of claim 43, wherein the I/O device issues commands to the controller via a wireless signal.

46. A method comprising:  
storing a virtual storage map (VSM) to allocate a primary virtual storage and a secondary virtual storage within a storage system;  
receiving requests from a processor to access the storage system; and  
selectively filtering unsupported requests including unpublished vendor-specific requests.

47. The method of claim 46, wherein receiving requests the requests with a controller coupled between the processor and a storage device via an input/output (I/O) bus.
48. The method of claim 46, wherein storing the VSM comprises storing the VSM in an embedded memory of a controller coupled to the processor via an input/output (I/O) bus.
49. A method comprising:  
storing a virtual storage map (VSM) to allocate a primary virtual storage and a secondary virtual storage;  
storing a record of locations of the secondary virtual storage to which data has been written after a time  $T_0$ ;  
receiving a save command via a wireless communication; and  
adjusting the VSM in response to the save command.
50. The method of claim 49, wherein adjusting the VSM comprises redefining the primary virtual storage to include the data written to the secondary storage device after  $T_0$ .
51. The method of claim 49, wherein receiving the save command via a wireless communication comprises receiving a signal from a handheld device.
52. An apparatus comprising:  
a computer-readable medium to store a virtual storage map (VSM) allocating a primary virtual storage and a secondary virtual storage within a storage system;  
an input/output (I/O); and  
a control unit to update the VSM in response to a save command; wherein the controller requires a user to select an operating mode from a default lock mode prior to accepting a save command.



53. The apparatus of claim 52, wherein the control unit receives the save command from software executing on a processor within a host computer.

54. A method comprising:

storing a virtual storage map (VSM) to define a set of storage units for a primary virtual storage and a secondary virtual storage;  
storing history data indicating a sequence of save and restore commands; and  
storing version data for the storage units of secondary virtual storage, wherein the version data associates one of the commands within the history data with each of the storage units of the secondary virtual storage.

55. The method of claim 54, further comprising:

receiving a save command;  
adjusting the VSM in response to the save command; and  
updating the history data.

56. The method of claim 54, further comprising:

receiving a restore command;  
adjusting the VSM in response to the restore command; and  
updating the history data.

57. The method of claim 54, further comprising storing a record of locations within the secondary virtual storage to which data has been written after a time  $T_0$ .

58. The method of claim 55, wherein adjusting the VSM comprises redefining the primary virtual storage to include the data written to the secondary storage device after  $T_0$ .